Institution of Structural Engineers Research Award 2011

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The Institution of Structural Engineers

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Project title: Full-scale fire tests on a cold-formed steel portal frame building

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Professor Richard Hull (University of Central Lancashire)
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Aims of research:
Practitioners have long argued that the design of steel portal frames in certain fire-boundary conditions is potentially unsafe. Recent numerical analyses have demonstrated that existing practices for the design of steel portal frames in fire boundary conditions can be unsafe in some conditions and over-prescribed in others. Large-scale fire tests will be conducted on a cold-formed steel portal frame to evaluate the current design practices and validate the results of the numerical models. The results will be used to develop performance-based design recommendations for future structures that cover both conventional hot-rolled steel and cold-formed steel. The effectiveness of intumescent paints to fire protect thin cold-formed steel columns will be assessed.

Benefits to structural engineering:
- Safer design of portal frames in potentially hazardous situations (e.g. industrial buildings, chemical factories) where it is imperative that the building does not collapse
- More economical design of portal frames in less hazardous situations (e.g. agricultural buildings) with large potential savings in carbon in terms of the size of the concrete foundation
- Improved safety for the fire service, with a better understanding of the collapse of buildings
- Provide the ground work for a computational design approach for all single story steel buildings giving the designer more realistic expectations about building performance allowing for fire protection to be focused and economical
- Improve opportunity for the UK steel industry to expand to Europe, where the dominance of steel for single storey steel buildings is not repeated, with fire performance often cited as the reason
- Improve understanding of the behaviour of cold-formed steel joints in fire
- Experimental data of the effectiveness of intumescent paints with thin cold-formed steel sections

Proposed finish date: January 2013